FOREST MANAGEMENT
DEMONSTRATION NOTE NO. 11

Effects of Hare Browsing, Competition, and Drought on Some 1920 and 1922 Planting Trials of Pine and Spruce

In 1920 and 1922 several experimental plantations of white spruce, jack and Scots pine were established by the Dominion Forest Service. The plantations are located at the Grandview Ranger Station in the southeast corner of the Duck Mountain Provincial Forest in west central Manitoba (Fig. 1). Three jack pine and three white spruce plantations were established in 1920 to compare the development of the two species on ploughed furrows and on hand prepared scalped spots. In 1922 another jack pine plantation and a Scots pine plantation were established. The plantations are 0.10 ha in area and are immediately adjacent to spruce and pine seeding trials carried out on similar soils in 1920 (Walker, 1988).

The 1920 plantations (7-20 to 12-20) were established under stands of small aspen, willow, and scrub birch. Seedlings in plantations 7-20 to 10-20 were planted in east-west furrows at 1.2 m spacing within each row. Furrows were made at 1.2 m intervals and these are still plainly visible. Plantations 11-20 and 12-20, at similar spacing, were planted in north-south rows on scalped spots

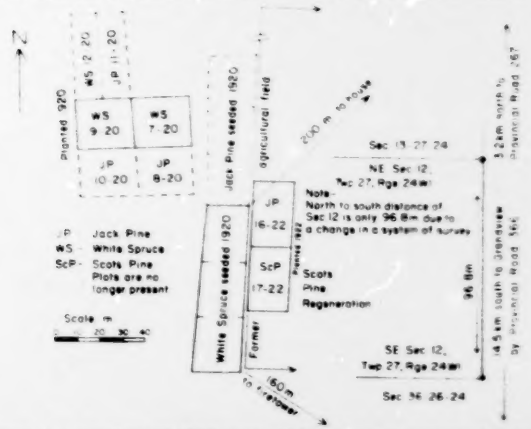

Figure 1. Location of 1920 and 1922 pine and spruce plantations

prepared with a grub hoe. The 1922 jack and Scots pine plantations (16-22 and 17-22), at 1.1 m spacing, were planted on previously cultivated land where grain had been grown (Fig. 1). Three to five-year-old seedlings or transplants, respectively, were used in each of the 1920 and 1922 plantations.

The 1920 spruce and pine stock was described as being in "very poor shape" due to bud flushing and freezing before leaving the Indian Head Nursery (Gill, 1930). Notes recorded in 1920 stated that the weather during the growing season was unusually hot with dry winds. No rainfall was reported until August 31. These drought conditions contributed to the high first year mortality. As a result, refill planting was carried out on four of the plantations in 1921 (Table 1). In 1924 severe snowshoe hare browsing occurred. The spruce seedlings were able to recover from the hare damage but growth was lost. The pine, however, suffered severe mortality. Subsequently, all plots, except one white spruce plot (7-20), were abandoned as failures.

In 1986 plantations 7-20 and 9-20 were well stocked to white spruce (Table 1). However, plantations 8-20 and 10-20, originally planted to jack pine, are currently stocked to 267 and 405 white spruce trees per hectare, respectively. These white spruce have naturally regenerated within the prepared furrows although they appear as if they were planted within the rows. Similarly, natural white spruce regeneration would have occurred within plantations 7-20 and 9-20 and these stems are estimated to account for about half of the trees within the two plantations. Survival in 1921 for plantation 9-20 was only 16%, but it is currently stocked to 1 515 white spruce per hectare. Considerable, mature trembling aspen is present in plantations 7-20 and 9-20; density is 532 and 252 stems per hectare respectively.

The 1922 jack pine plantation (16-22) has good form and due to the initial 1.1 m spacing it is well stocked despite a survival rate of only 27% (Table 2). Survival in the Scots pine plantation (17-22) is only 7% and the trees have very poor form. The stems are generally crooked, quite tapered, and thick branches have developed on widely spaced trees. Broken and forked tops are common. Notes recorded in 1943 stated that an ice storm several years previous damaged some trees in the jack pine plantation and suggested that they should be removed. No mention was made of the Scots pine but similar damage may be responsible for some of the current poor form.

In 1986 there was little trembling aspen ingress into plantations 16-22 and 17-22. Aspen trees are found along the north and south sides of the plots suggesting that any ingress into the plantations was removed as it occurred. Natural jack and Scots pine regener-

TABLE 1. Early survival of 1920 plantations and stocking after 67 years

Plantation	Species	Stock age yrs	No. planted ha May 28 – June 2 1920	Percent survival Oct., 1920	Refills ha May 11-12, 1921 Age	No.	Percent survival* Oct., 1921	Density no. ha 1986
7-20	wS**	5	6 681	68	5	4 161	96	1 962
8-20	jP***	5	6 681	26	5	4 665	66	0
9-20	wS	3	6 681	22	–	Nil	16	1 515
10-20	jP	3	6 681	7	–	Nil	4	0
11-20	wS	5	6 681	20	5	3 736	62	0
12-20	wS	5	6 681	33	5	3 637	45	–****

* Originals and refills
** wS – white spruce
*** jP – jack pine
**** No measurements taken

TABLE 2. Survival and growth of the 1922 jack and Scots pine plantations

	Plantation	Year of measurement						
		1922	1923	1925	1929	1946	1957	1986
Years of growth since planting		1	2	4	8	25	36	64
Stock type (Planting date)	jP*	3 to 5-year-old transplants (May 16-17, 1922)						
	ScP							
No. planted per ha	jP	7 868						
	ScP	7 798						
Survival %	jP	76	76	75	34	37	34	27
	ScP	91	90	90	88	13	12	7
Average height m	jP	–	0.3	0.5	–	7.3	11.0	17.9
	ScP	–	0.3	0.5	–	6.2	10.7	15.2
Average diameter cm	jP					9.1	12.7	17.3
	ScP					12.4	16.5	25.6
Basal area m^2 ha	jP						34	51
	ScP						20	29
Total volume** m^3 ha	jP						177	379
	ScP						–	–
Merchantable volume*** m^3 ha	jP						109	339
	ScP						–	–

* jP – jack pine ScP – Scots pine ** Table 28 (Dom. For. Serv., 1948). *** Table 30 (Dom. For. Serv., 1948) All trees 10.2 cm dbh

ation has become established along the east side of the plantations in the adjacent former agricultural field. This regeneration dates back to 1977 when the grass in the field was no longer controlled by mowing. In 1986 Manitoba Natural Resources removed the jack pine regeneration from the field and only Scots pine saplings remain.

All the 1920 jack pine and white spruce plantations were severely damaged or destroyed by hare browsing in 1924, but the 1922 jack and Scots pine plantations have survived despite the loss of the current leaders. Seventy-one percent of the jack pine and 75% of the Scots pine terminals were reported browsed in 1924. As browsing usually takes place in winter, snow cover may have protected the lower portions of the seedlings.

Aspen, willow and birch overtopped the seedlings planted within the furrows (plantations 7-20 to 10-20) and on the hand-prepared scalped spots (plantations 11-20 and 12-20). Consequently, they may have provided good protective cover for hares. This may have prolonged the yearly browsing period and seedling damage. Uncontrolled hardwood ingress following abandonment of these plots may then have contributed to the mortality of the remaining seedlings.

The failure of plantations 7-20 to 12-20 demonstrates the need to control competing vegetation within planting areas. Removal of overtopping trees and shrubs would have eradicated the habitat required by snowshoe hares thereby reducing browse damage (Radvanyi, 1987). This, also would have permitted uninhibited seedling growth. The current form of the jack pine in plot 16-22 demonstrates the inital high density that is required for this species to develop good stem form and small limb diameter.

References:

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